

WHAT IS CLAIMED IS:

- 1 1. A gerotor and bearing apparatus for a downhole whirling mass orbital vibrator
2 generating vibration in a borehole, which apparatus comprises:
3 a gerotor with an inner gear rotated by a shaft having one less lobe than an outer gear;
4 a whirling mass attached to said shaft;
5 at least one bearing attached to said shaft engaging at least one sleeve; and
6 means to rotate said inner gear, said mass, and said bearing in a selected rotational
7 direction to cause said mass, said inner gear and said bearing to backwards whirl in an opposite
8 rotational direction.
- 1 2. A gerotor and bearing apparatus as set forth in Claim 1 wherein said bearing is a track
2 roller bearing.
- 1 3. A gerotor and bearing apparatus as set forth in Claim 1 including a pair of bearings
2 attached to said shaft engaging a pair of sleeves.
- 1 4. A gerotor and bearing apparatus as set forth in Claim 3 wherein said pair of bearings
2 and said pair of sleeves are replaceable.
- 1 5. A gerotor and bearing apparatus as set forth in Claim 3 wherein said bearings are on
2 opposite ends of said whirling mass.

1 6. A gerotor and bearing apparatus as set forth in Claim 1 wherein said means to rotate
2 said inner gear, said mass, and said bearing in a selected rotational direction includes a drive shaft
3 with a plurality of U-joints.

1 7. A gerotor and bearing apparatus as set forth in Claim 1 including a fluid pump
2 powered by said shaft providing a self-contained drip lubrication system.

1 8. A gerotor and bearing apparatus as set forth in Claim 7 including a pair of U-joint
2 assemblies.

1 9. A gerotor and bearing apparatus as set forth in Claim 1 including a pair of said
2 gerotors spaced from each other and coaxially aligned.

1 10. A gerotor and bearing apparatus as set forth in Claim 1 wherein said backwards
2 whirling mass is an elongated cylinder.

1 11. A gerotor and bearing apparatus as set forth in Claim 1 wherein said backwards
2 whirling mass produces vibration energy which is used in enhanced fluid recovery.

1 12. A gerotor and bearing apparatus as set forth in Claim 1 wherein said backwards
2 whirling mass produces vibration energy which is used as a seismic source.

1 13. A gerotor and bearing apparatus as set forth in Claim 1 wherein said backwards
2 whirling mass is an elongated cylindrical configuration with a diameter less than said housing.

1 14. A gerotor and bearing apparatus as set forth in Claim 1 wherein said inner gear
2 backwards whirl at a speed defined by a factor

$$K = \frac{n}{N-n} \quad \text{where } n = \text{number of lobes on inner rotor and} \\ N = \text{number of lobes on outer rotor}$$

1 15. A method to generate vibrational energy in a borehole, which method comprises:
2 rotating an inner gear of a gerotor by a shaft in a selected rotational direction wherein
3 said inner gear has one less lobe than an outer gear;
4 rotating a whirling mass in a selected rotational direction by rotation of said shaft so
5 that said mass and said inner gear backwards whirl in a direction opposite to said selected rotational
6 direction; and
7 transmitting centrifugal force created by said whirling mass from at least one bearing
8 to at least one cylindrical sleeve by contacting said sleeve.

1 16. A method to generate vibrational energy in a borehole as set forth in Claim 15
2 including transmitting said centrifugal force to a downhole casing.

1 17. A method to generate vibrational energy in a borehole as set forth in Claim 15
2 wherein said centrifugal force generates vibrational energy.

1 18. A method to generate vibrational energy in a borehole as set forth in Claim 15
2 including contacting a sleeve with at least one bearing rotated by said shaft.

1 19. A method to generate vibrational energy in a borehole as set forth in Claim 15
2 including transmitting said centrifugal force from said sleeve to slips and to a casing.

1 20. A gerotor and bearing apparatus for a downhole whirling mass orbital vibrator
2 generating vibration in a borehole, which apparatus comprises:
3 a pair of gerotors spaced from each other, each gerotor with an inner gear rotated by
4 a shaft having one less lobe than an outer gear;
5 a whirling mass attached to said shaft;
6 a pair of bearings attached to said shaft on opposite ends of said whirling mass;
7 means to rotate said inner gears, said mass, and said bearings in a selected rotational
8 direction to cause said gears, said mass, and said bearings to backwards whirl in an opposite
9 rotational direction; and
10 means to maintain angular radial position and angular alignment between said ends
11 of said rotating mass.